PERSPECTIVES OF BIOLOGICAL CONTROL TO THE SOUTH AMERICAN TOMATO MOTH, *Tuta absoluta* IN GEORGIA

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**ABSTRACT**

The South American tomato moth, *Tuta absoluta* (Povolny) (Lepidoptera: Gelechiidae) a new, invasive pest, introduced from Turkey from 2011 revealed in tomato seedlings in the Western Georgia (Khobi, village Khorga). Cultivated and wild plants from *Solonaceae* family are the hosts for pest, but the tomato, eggplant and pepper considered as the most important. In recent years the rapid growth of *T. absoluta* population has caused the significant damage of tomato plants in greenhouses. The yield loss of tomatoes exceed 35-50% and possible to reach 60-80%. During vegetation season *T. absoluta* can develop 10-12 generations and consequently necessary to conduct control measures. The usage of environmentally safe means, especially in greenhouses, is advisable. Regarding this, study was conducted on the action of bacterial preparation „*Delphin*” (on the base *Bacillus thuringiensis* subsp. Kurstaki, strain SA-11) and the entomopathogenic nematode - *Steinerma feltiae*, “Georgian strain”. 15 tomato plants were settled with different instars of *T. absoluta* 8-12 larvae and treated by „*Delphin*” 1% solution in laboratory. Nematode suspension (500 IJs/ml) was used for 8-12 larvae treatment and tomato pots were placed at 23-25°C and 60-70% RH. The tomato test plants were treated twice by bacterial and nematode preparations to 7 days interval, whereas control was applied with distilled water. The mortality of larvae was compared to the control, using Abbott’s formula. The action of biological means for 3, 5, 7, 10 days after treatment were detected. Larvae infestation was detected after 48 and 72 hr. Data was analysed by two-way ANOVA (p=0.05). The mortality index for “*Delphin*” preparation achieved to 95.1%, for nematode suspension – 79.2%. According to data of preliminary laboratory assays, the research will be continued to establish biological effectiveness in greenhouse conditions.

**Key words:** Tomato moth, IPM, Bacterial preparation, Entomopathogenic nematode

**INTRODUCTION**

Besides to intensive development of greenhouse farms (more than 400-500 ha) the number of introduced pests have increased in Georgia during last years. According to Ministry of Agriculture of Georgia 2011 year’s observation data (internet sources), the South American tomato moth, *Tuta absoluta* (Povolny) (Lepidoptera: Gelechiidae) and the serpentine leaf miner, *Liriomyza trifolii* (Burgess) (Diptera: *Agromyzidae*), as new invasive pests have been added to the greenhouse pests’ list. Our observations show, that among other pests: the greenhouse whitefly - *Trialeurodes vaporariorum* (Westw.), the melon aphid - *Aphis gossypii* (Glow.), the green peach aphid - *Myzodes persicae* (Sulz), the red spider mite - *Tetranychus urticae* (L.), *L. trifolii* - thripses (Chubinishvili et al., 2013), *T. absoluta* is more economic pest of tomato in greenhouses of Georgia, where the chemical pesticides treatment can’t give satisfaction results.
T. absoluta is considered as an economically damaging pest in many countries. It is distributed from South American Continent (Garcia, 1982), throughout many European countries (EPPO, 2005). In Europe it was initially detected in the Iberian Peninsula in 2006 (Urbaneja et al., 2007). Since it has rapidly moved across the Mediterranean area and has been detected in France, Italy and the United Kingdom (UK) (Desneux et al., 2010; Urbaneja et al., 2012). Initially the struggle against pest was started by chemical treatments, hence soon these methods were reduced because of rapid resistance development of the pest (Cabello et al., 2012). Among all control measures to T. absoluta, the biological means had priority in integrated pest management (IPM) system.

**MATERIAL AND METHODS**

T. absoluta damage and the average density of pest population were calculated by point system by using of accepted method (Dospekhov, 1979). The infested tomato leaves were collected in greenhouses and transferred to laboratory. The preliminary laboratory experiments were carried out on action of bacterial preparation „Delphin“ (based on Bacillus thuringiensis subsp. Kurstaki, strain SA-11) and the entomopathogenic nematode (EPN) - Steinernema feltiae, “Georgian strain”. The different instars larvae (8-10) were settled on 15 tomato potted plants and treated with 1% of „Delphin“ solution. Nematode suspension (500 IJs/ml) was used for treatment 15 tomato seedlings, settled with 8-12 larvae each at 23-25°C and 60-70% RH conditions. In both cases (bacteria and nematode) the tomato plants were treated twice of 7 days interval and control variants applied with distilled water. The mortality of tested cadavers was compared to control mortality using Abbott’s formula (Abbott, 1925).

The action of biological means for 3, 5, 7, 10 days after treatment were detected. The infected larvae were observed after 48 - 72 hr on 10th day of experiment. Data was analysed by two – way ANOVA (p=0.05).

**RESULTS AND DISCUSSION**

Since 2011 T. absoluta is limited spread quarantine pest in Georgia according to data from the Ministry of Agriculture of Georgia. Initially the pest revealed in tomato seedlings imported from Turkey in the Western Georgia, then it was rapidly spread the Eastern regions of country, in suburbs of Tbilisi, Mtskheta, Marneuli, Gardabani greenhouses and other private farms, were the tomato Holland sort “Big-Bel” was distributed.

The phenological calendar of pest insect, T. absoluta was compiled for Mtskheta region (Figure, 1). The great damage on leaves was achieved to 50-75% (Figure 2).
The action of biological means after treatment is presented (Figure 3, 4). Two-way analysis were used to compare *T.absoluta* corrected mortality to biological means “Delfin” and “Georgian strain” and their interaction for different days (p value = 0.05) (Figure 5).

The mortality index of first and second instars of *T.absoluta* larvae, treated by Delfine 1%, has achieved to 95.1% after 5-10 days. In the case of EPN “Georgian strain” 500 IJs/ml, it was established that larvae invasion has achieved 79.2%. The high volume of EPN, *Steinernema feltiae* foliar sprays is described by Jacobson & Martin (2011). Considering the results, Delphin and EPN can be included to *T.absoluta* IPM system. It should be noted that third and fourth instars larvae are protected by leaf folds or fruits and their control was difficult (Poe, 1973). Insect populations may be controlled at the first or second larval instars with recommended bio-insecticides.

![Figure 3. *T.absoluta* Mortality in laboratory](image1)

![Figure 4. The corrected mortality of *T.absoluta* larvae for different days](image2)

![Figure 5. Interaction of biological means “Delfin” and “Georgian strain” to *T.absoluta*](image3)
This study is first attempt to control the South American tomato moth, *Tuta absoluta* with biological means in Georgia. Based on the results obtained in preliminary laboratory experiments the investigations will be continue to establishment of biological effectiveness in greenhouse conditions. The tested safe biological means will take an important place for vegetables protection from pest organisms in the system of integrated pest management (IPM).

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**REFERENCES**


